WHAT IS CLAIMED IS:

1. 1.   A communication device configured to perform a plurality of
2. functions, comprising:
3.   a plurality of heterogeneous computational elements; and
4.   an interconnection network coupled to the plurality of heterogeneous
5. computational elements, the interconnection network operative to configure the plurality of
6. heterogeneous computational elements;
7.   wherein a first group of heterogeneous computational elements is configurable
8. to form a first functional unit to implement a system acquisition function;
9.   wherein a second group of heterogeneous computational elements is
10. configurable to form a second functional unit to implement a communication function; and
11.   wherein if the communication function is idle, one or more of the second
12. group of heterogeneous computational elements are reconfigurable by the interconnection
13. network to implement the system acquisition function.

1. 2.   The communication device of claim 1 wherein the first functional unit
2. is a searcher.

1. 3.   The communication device of claim 1 wherein the communication
2. device is a cellular phone, a Bluetooth communication device or a 802.11 communication
3. device.

1. 4.   The communication device of claim 1 wherein if the communication
2. function is idle, the one or more of the second group of heterogeneous computational
3. elements are reconfigurable to implement the system acquisition function by forming one or
4. more additional instances of the first functional unit.

1. 5.   The communication device of claim 1 wherein if the communication
2. function is idle, one or more of the first group of heterogeneous computational elements and
3. the one or more of the second group of heterogeneous computational elements are
4. reconfigurable to form a single functional unit to implement the system acquisition function.

1. 6.   The communication device of claim 1 wherein if the communication
2. function is idle, the one or more of the second group of heterogeneous computational

3   elements are reconfigurable by the interconnection network to implement one or more of the

4   plurality of functions other than the communication function.

1   7.   The communication device of claim 1 wherein if a third function is to

2   be implemented, one or more of the first group of heterogeneous computational elements

3   and/or the one or more of the second group of heterogeneous computational elements are

4   reconfigurable by the interconnection network to implement the third function.

1   8.   A communication device comprising:

2   a plurality of reconfigurable matrices, the plurality of reconfigurable matrices

3   including a plurality of heterogeneous computational units, each heterogeneous

4   computational unit having a plurality of fixed computational elements, the plurality of fixed

5   computational elements including a first computational element having a first architecture

6   and a second computational element having a second architecture, the first architecture

7   distinct from the second architecture, the plurality of heterogeneous computational units

8   coupled to an interconnect network and reconfigurable in response to configuration

9   information; and

10   a matrix interconnection network coupled to the plurality of reconfigurable

11   matrices, the matrix interconnection network operative to reconfigure the plurality of

12   reconfigurable matrices in response to the configuration information for a plurality of

13   operating modes;

14   wherein a first group of heterogeneous computational units is reconfigurable

15   to form a first functional unit to implement a system acquisition mode;

16   wherein a second group of heterogeneous computational units is

17   reconfigurable to form a second functional unit to implement a communication mode;

18   wherein if the communication mode is idle, one or more of the second group

19   of heterogeneous computational units are reconfigurable to implement the system acquisition

20   mode.

1   9.   The communication device of claim 8 wherein the first functional unit

2   is a searcher.

1   10.   The communication device of claim 8 wherein the communication

2   device is a cellular phone, a Bluetooth communication device or a 802.11 communication

3   device.

1   11.   The communication device of claim 8 wherein if the communication
2   mode is idle, the one or more of the second group of heterogeneous computational units are
3   reconfigurable to implement the system acquisition mode by forming one or more additional
4   instances of the first functional unit.

1   12.   The communication device of claim 8 wherein if the communication
2   mode is idle, one or more of the first group of heterogeneous computational units and the one
3   or more of the second group of heterogeneous computational units are reconfigurable to form
4   a single functional unit to implement the system acquisition mode.

1   13.   The communication device of claim 8 wherein if the communication
2   mode is idle, the one or more of the second group of heterogeneous computational units are
3   reconfigurable to implement one or more of the plurality of operating modes other than the
4   communication mode.

1   14.   The communication device of claim 8 wherein if a third operating
2   mode is to be implemented, one or more of the first group of heterogeneous computational
3   units and/or the one or more of the second group of heterogeneous computational units are
4   reconfigurable to implement the third operating mode.

1   15.   A communication device comprising:
2   a plurality of heterogeneous computational elements, the plurality of
3   heterogeneous computational elements including a first computational element and a second
4   computational element, the first computational element having a first fixed architecture of a
5   plurality of fixed architecture and the second computational element having a second fixed
6   architecture of the plurality of fixed architectures, the first fixed architecture being different
7   than the second fixed architecture, and the plurality of fixed architectures including functions
8   for memory, addition, multiplication, complex multiplication, subtraction, configuration,
9   reconfiguration, control, input, output, and field programmability; and
10   an interconnection network coupled to the plurality of heterogeneous
11   computational elements, the interconnection network operative to configure the plurality of
12   heterogeneous computational elements;
13   wherein a first group of heterogeneous computational elements is
14   reconfigurable to form a first functional unit to implement a system acquisition function;

15   wherein a second group of heterogeneous computational elements is

16   reconfigurable to form a second functional unit to implement a communication function; and

17   wherein if the communication function is idle, one or more of the second

18   group of heterogeneous computational elements are reconfigurable by the interconnection

19   network to implement the system acquisition function.

1   16.   The communication device of claim 15 wherein the first functional unit

2   is a searcher.

1   17.   The communication device of claim 15 wherein the communication

2   device is a cellular phone, a Bluetooth communication device or a 802.11 communication

3   device.

1   18.   The communication device of claim 15 wherein if the communication

2   function is idle, the one or more of the second group of heterogeneous computational

3   elements are reconfigurable to implement the system acquisition function by forming one or

4   more additional instances of the first functional unit.

1   19 .   The communication device of claim 15 wherein if the communication

2   function is idle, one or more of the first group of heterogeneous computational elements and

3   the one or more of the second group of heterogeneous computational elements are

4   reconfigurable to form a single functional unit to implement the system acquisition function.

1   20.   The communication device of claim 15 wherein if the communication

2   function is idle, the one or more of the second group of heterogeneous computational

3   elements are reconfigurable by the interconnection network to implement one or more of the

4   plurality of functions other than the communication function.

1   21.   The communication device of claim 15 wherein if a third function is to

2   be implemented, one or more of the first group of heterogeneous computational elements

3   and/or the one or more of the second group of heterogeneous computational elements are

4   reconfigurable by the interconnection network to implement the third function.

1   22 .   A communication device comprising:

2   a plurality of heterogeneous computational elements, the plurality of

3   heterogeneous computational elements including a first computational element and a second

4 computational element, the first computational element having a first fixed architecture and

5 the second computational element having a second fixed architecture, the first fixed

6 architecture being different than the second fixed architecture; and

7   an interconnection network coupled to the plurality of heterogeneous

8 computational elements, the interconnection network operative to configure a first group of

9 heterogeneous computational elements to form a first functional unit for a first functional

10 mode of a plurality of functional modes, in response to first configuration information, and

11 the interconnection network further operative to reconfigure a second group of heterogeneous

12 computational elements to form a second functional unit for a second functional mode of the

13 plurality of functional modes, in response to second configuration information, the first

14 functional mode being different than the second functional mode, and the plurality of

15 functional modes including system acqusition operations, linear algorithmic operations, non-

16 linear algorithmic operations, finite state machine operations, memory operations, and bit-

17 level manipulations;

18   wherein if the second functional mode is idle, one or more of the second group

19 of heterogeneous computational units are reconfigurable to implement the first functional

20 mode.

     23. The communication device of claim 22 wherein the first functional

mode is the system acquisition operations and the first functional unit is a searcher.

1   24. The communication device of claim 22 wherein the communication

2 device is a cellular phone, a Bluetooth communication device or a 802.11 communication

3 device.

1   25. The communication device of claim 22 wherein if the second

2 functional mode is idle, the one or more of the second group of heterogeneous computational

3 elements are reconfigurable to implement the first functional mode by forming one or more

4 additional instances of the first functional unit.

1   26. The communication device of claim 22 wherein if the second

2 functional mode is idle, one or more of the first group of heterogeneous computational

3 elements and the one or more of the second group of heterogeneous computational elements

4 are reconfigurable to form a single functional unit to implement the first functional mode.

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1   27.   The communication device of claim 22 wherein if the second

2 functional mode is idle, the one or more of the second group of heterogeneous computational

3 elements are reconfigurable by the interconnection network to implement one or more of the

4 plurality of functional modes other than the second functional mode.

1   28.   The communication device of claim 22 wherein if a third functional

2 mode is to be implemented, one or more of the first group of heterogeneous computational

3 elements and/or the one or more of the second group of heterogeneous computational

4 elements are reconfigurable by the interconnection network to implement the third functional

5 mode.

1   29.   A method for allocating hardware resources within a communication

2 device, the hardware resources including a plurality of heterogeneous computational

3 elements, the method comprising:

4   in response to first configuration information, configuring a first group of

5 heterogeneous computational elements to form a first functional unit to implement a system

6 acquisition function and configuring a second group of heterogeneous computational

7 elements to form a second functional unit to implement a communication function; and

8   in response to second configuration information, reconfiguring one or more of

9 the second group of heterogeneous computational elements to implement the system

10 acquisition function.

1   30.   The method of claim 29 wherein the first functional unit is a searcher.

1   31.   The method of claim 29 wherein the communication device is a

2 cellular phone, a Bluetooth communication device or a 802.11 communication device.

1   32.   The method of claim 29 wherein the second configuration information

2 is generated when the communication function is idle.

1   33.   The method of claim 29 wherein in response to the second

2 configuration information, the one or more of the second group of heterogeneous

3 computational elements are reconfigured to form one or more additional instances of the first

4 functional unit to implement the system acquisition function.

1   34. The method of claim 29 wherein in response to the second

2   configuration information, one or more of the first group of heterogeneous computational

3   elements and the one or more of the second group of heterogeneous computational elements

4   are reconfigured to form a single functional unit to implement the system acquisition

5   function.

1   35. The method of claim 29 further comprising:

2   in response to third configuration information, reconfiguring one or more of

3   the first group of heterogeneous computational elements and/or the one or more of the second

4   group of heterogeneous computational elements to implement a third function.

1   36. A method for allocating hardware resources within a communication

2   device, the hardware resources including a plurality of heterogeneous computational

3   elements, the method comprising:

4   in response to first configuration information, configuring a first group of

5   heterogeneous computational elements to implement a system acquisition function; and

6   in response to second configuration information, reconfiguring one or more of

7   the first group of heterogeneous computational elements to implement a communication

8   function.

1   37. The method of claim 36 wherein in response to the first configuration

2   information, the first group of heterogeneous computational elements is configured to form

3   one or more functional units to implement the system acquisition function.

1   38. The method of claim 37 wherein each of the one or more functional

2   units is a searcher.

1   39. The method of claim 36 wherein the first configuration information is

2   generated when the system acquisition function is needed and the second configuration

3   information is generated when the system acquisition function is completed.

1   40. The method of claim 29 wherein the communication device is a

2   cellular phone, a Bluetooth communication device or a 802.11 communication device.